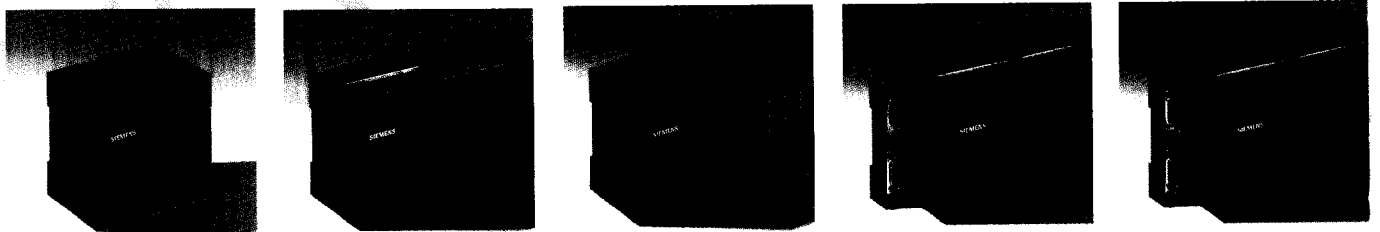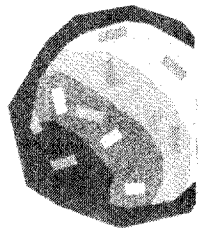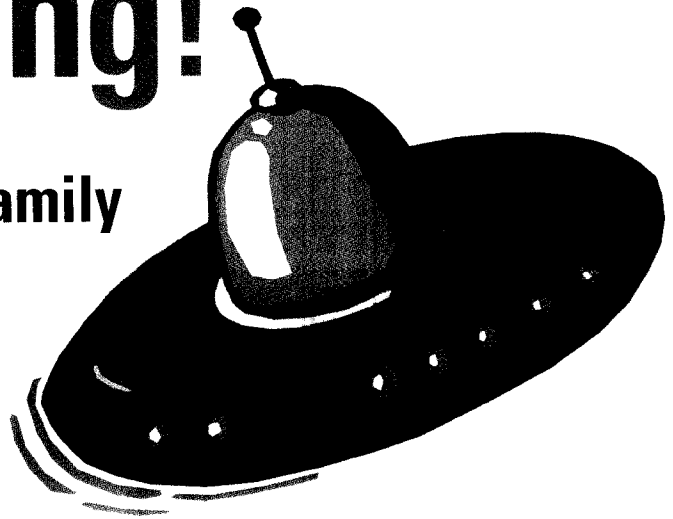# SIEMENS

All Set for
Easy
Controlling!
SIMATIC S7-200,
the New Micro PLC Family

SIMATIC S7-200:
# Infinitely Versatile – Convincingly Simple

Ease-of-use, fast and superior communication capabilities: these are the characteristics of the SIMATIC® micro PLC, which benefit newcomers to the S7-200 world and old hands alike. The allround talent excels in its ease of use, outstanding real-time functions in this class, and unlimited communication possibilities. The small unit packs so much power that it facilitates complex solutions in stand-alone mode, in networks, and within distributed systems. So if you want the most effective automation with the least effort, the SIMATIC S7-200 is the one for you!

The micro that's at home everywhere!

Whether for freight elevators or lighting, presses or wood processing machines: real-time, ease-of-use and superior communication capabilities the micro PLC opens up more and more fields of application in which PLCs were previously not an issue (perhaps because special electronics were developed or time-delay relays and contactors were used). The S7-200 proves its strength both in simple control applications and in solving complex automation tasks.

Cleaning and mortar machines, suction plants, baling presses, electrical installation, conveyor systems, wood machining equipment, hydraulic elevators, laboratory equipment, the food industry, modem applications, gate controllers – these are just some examples of applications in which the micro shows what it can do.
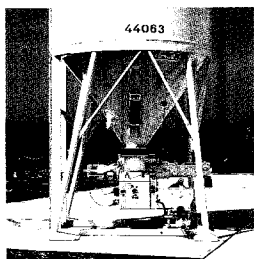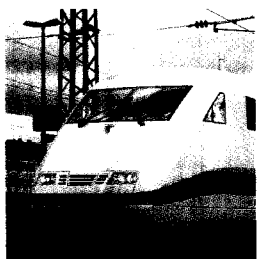
The micro PLC has arrived in many industries and applications, e.g. in elevators, wood processing, compressor controllers ...
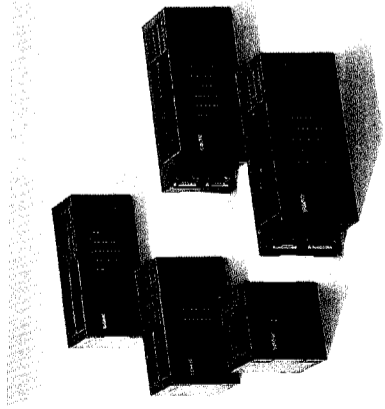
3
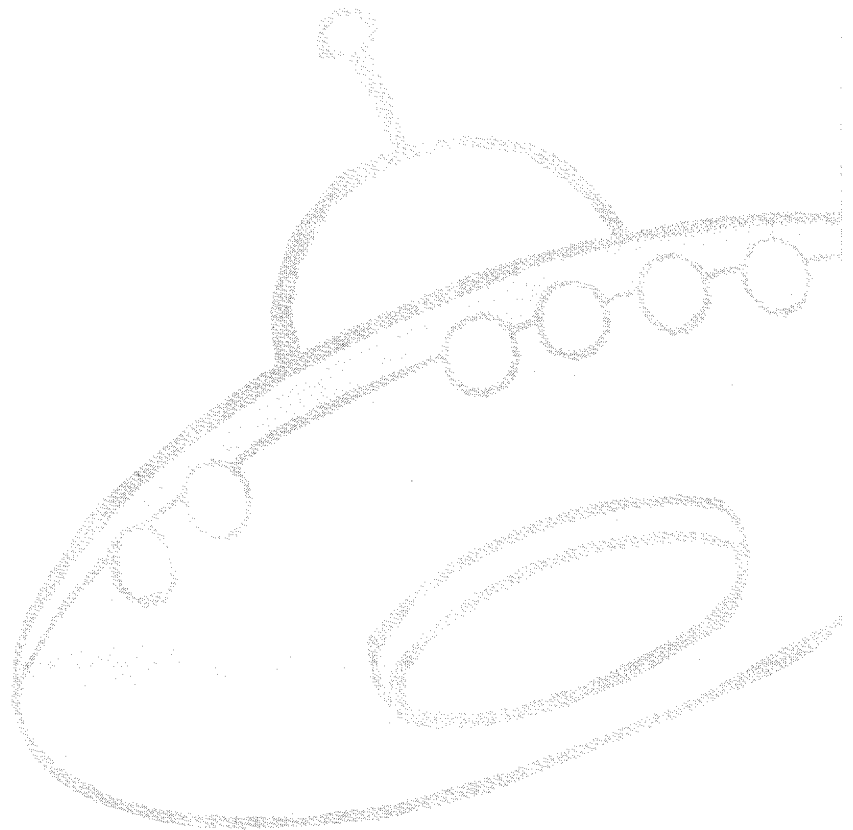
The Modular Micro Controller Family:
5 Specialists to Cover All Tasks
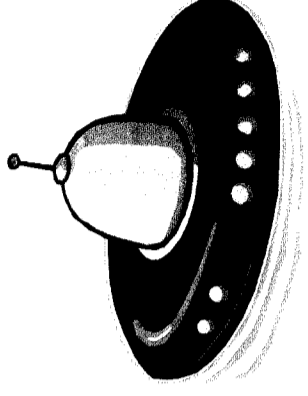
On the subject of product spectrum and capability, the SIMATIC S7-200 offers everything you would expect from a micro PLC family. The S7-200 family members are five CPUs with varied levels of performance, a large selection of application-oriented expansion modules, simple programming software STEP 7 MicroWIN and STEP 7 Micro/DOS, debugged ready-to-use applications software and simple, comprehensive documentation.

The S7-200 offers unlimited communication possibilities, with an S7-200 system interface (PPI interface) for the best connections to programming devices, PCs (via PC/PPI cable), TD 200 text displays, SIMATIC HMI operator panels and other SIMATIC S7-200s in master-slave operation (from CPU 214 as master); with a freely programmable interface protocol (serial ASCII); and with a connection to PROFIBUS-DP and AS-Interface bus.

CPU 210
The specialist for serial application. With a specially small casing. For users who want a particularly low-cost PLC for identical, repetitive tasks.

CPU 212
The low-price top-performer. This CPU is ideal for newcomers, for small applications (with max. 500 instructions) and as a PPI slave.

CPU 214
The multitalent. The controller for sophisticated tasks, thanks to a larger memory, more inputs/outputs and many integrated special functions (e.g. fast counter, timed and hardware interrupts or pulse outputs).

CPU 215
The bus specialist offers optimal communication capability. Also has a PROFIBUS-DP interface on board from the start. The CPU excels in the family with maximum real-time performance, especially for distributed control of fast processes locally as a slave in the PROFIBUS-DP network (baudrate 12 Mbit/s).

CPU 216
The powerpack with 2 PPI interfaces, 40 inputs/outputs and the best real-time performance (equal to CPU 215), for the control of even large machine and plant sections. The second PPI interface can also be used for the simultaneous connection of modems, printers, barcode readers or non-Siemens HMI devices, for example.

Expansion modules

DI/DO/AI/AO

PPI/Freeport

LOGO!

Actuators S7-300

AS-Interface module

Sensors

STEP 7 Micro Programming device
PC
Text display
Operator panel
Printer
Modem
Barcode reader

The micro PLC is available in 5 different basic units – that means the right CPU for every application!

Easy to Start – Easy to Control!
The S7-200 Makes it Easy for You

With the micro PLC, we've made simplicity our motto. Whether installation, programming, software or on-line help, the S7-200 has everything to make users' lives easier. And whether you're new to PLCs and have always found programming small control tasks a hassle, or whether you're already an old hand who wants to change over to the micro, you can't help but benefit from so much simplicity and user convenience – because you're guaranteed to save time and money!

The S7-200 starter kit: just jump in and off you go

Starting out in the micro PLC world has never been easier than with the starter kit. It allows you to learn the first steps right through to creating your own programs in no time. The package contains all the hardware and software you need to get going: a CPU 212 relay including simulator and DIN rail, a PC/PPI connecting cable, Windows-based programming software STEP 7 Micro/WIN, the one-hour primer with teaching model and practice diskette, and the S7-200 Manual.

Programming, software etc. Take it easy!

We've made the programming software and program structures especially easy: whether STEP 7 Micro/WIN (based on Windows) or STEP 7 Micro/DOS, the user-friendly operator interface and the intuitive and context-sensitive on-line help facilitate programming in STL (statement list) or LAD (ladder diagram).
Powerful but easy-to-use standard instructions reduce programming effort to a minimum. The simple program structure guarantees a clear overview of the user program. Subroutines or interrupt programs are simply attached to the main program.

The best service in the world is available any time, any place!

Naturally we are available all over the world to advise and assist with members of the large SIMATIC micro PLC family. If you have a SIMATIC S7-200, you can count on the best service in the world in over 150 countries: repair service, 24-hour spare parts service, special program support or one of the following global hotlines:

- Europe/Africa ++49 (9 11) 8 95-70 00
- USA/Nafta ++1(4 23) 4 61-26 99
- Asia/Pacific ++65-7 40-70 00

Of course you can also find out more through the Internet (www.aut.siemens.de or www.aut.sea.siemens.com/s7-200).

Powerful instructions are available for complex functions such as data exchange in a network, administration of tables, and even floating-point arithmetic, and PID control. With the "Force" function, you can define the status of inputs/outputs, flags and even user data during the current process or program processing. This is particularly useful if you want to test the program logic without directly interfacing to the process or if you want to debug parts of the program. The instruction set is easy to learn, thanks to the fewer basic instructions. With 100 powerful but simple instructions, programming is highly efficient. With floating-point arithmetic, for example, it's as easy as using a pocket calculator! Incidentally, our library of helpful tips and ready-to-run programs makes it easier to learn and implement your applications.
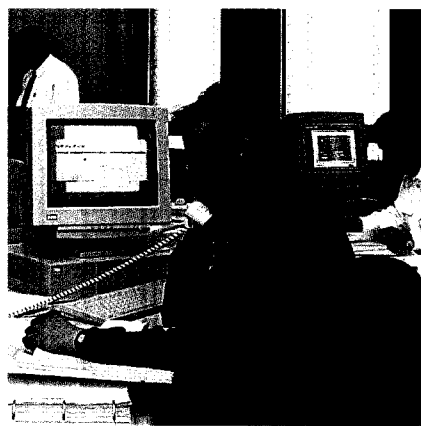
And what's more, you can also call up this information (such as answers to frequently asked customer questions, FAQs) any time via modem.
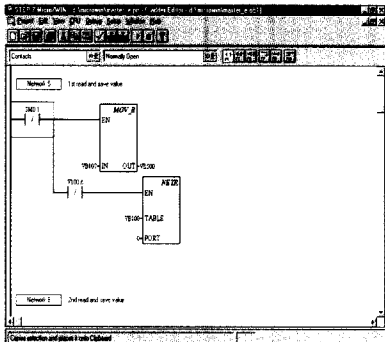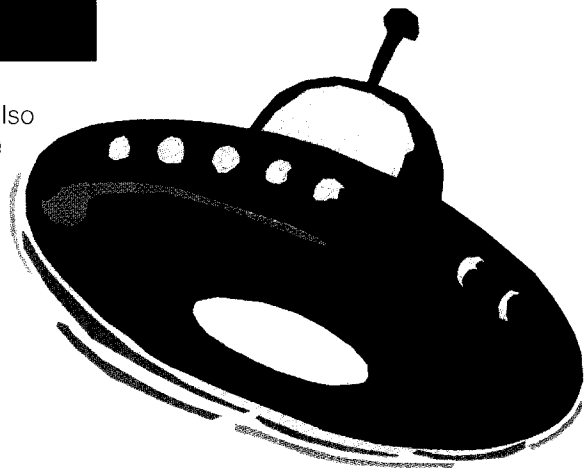
Great Moments in Communication ...

The SIMATIC S7-200 is also unbeatable when it comes to communication and real-time performance: both make the S7-200 the ideal partner in complex automation solutions, even with distributed intelligence. It gets straight to the point with the familiar ease of operation, because data exchange between CPU and HMI devices (operator control and monitoring) runs automatically, and the operating system supports data communication in the S7-200 network (PPI protocol). Simply entering "WHAT – WHEN – WHERE" in the user program causes the S7-200 to function as a master on the bus. And it doesn't cost a penny because the micro already has the entire hardware and PPI software integrated from the start. The S7-200 thus offers free access to unlimited communication.
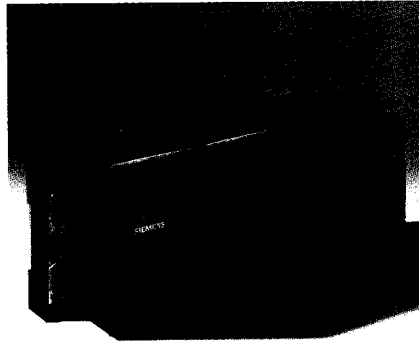
The micro's got it: the best connections to PROFIBUS-DP

The S7-200 has the best connections to the leading fieldbus system PROFIBUS-DP – made possible by the bus specialist CPU 215 with integrated PROFIBUS-DP interface. So you're in the best hands for open communication between all SIMATIC system components, right through to the fast fieldbus range (12 Mbit/s baudrate).

Data exchange with PPI: Simple and flexible!

The micro has unlimited communication possibilities because the integrated RS-485 interfaces can be run in two modes with all CPUs: thanks to the PPI protocol, as a master with a data transmission speed of 19.2 Kbit/s, the S7-200 can establish connections to programming devices, PCs, TD 200 text displays, SIMATIC HMI operator panels, and other S7-200s. Up to 31 controllers can be programmed, controlled and monitored on a common data cable (so with two interfaces, up to 62 nodes!) with a single programming device, PC, TD 200 or OP – and can exchange data. The freely programmable interface protocol is programmed and configured in the user program – even in ASCII format if need be. This allows you to communicate

with whatever you want: modem, printer, barcode reader, motor-drive, terminals or other PLCs – the S7-200 is completely flexible!

### Even more communication with AS-Interface

Thanks to the communication module CP 242-2, the S7-200 AS-i Master, which can be connected as an expansion module, actuator sensor interface (AS-i) devices can now be connected to the S7-200 family. A total 31 AS-i nodes each with a maximum of 4 inputs or 4 outputs or 124 AS-i inputs and 124 AS-i outputs per CP can be connected via two lines. Up to 2 AS-i Masters can be connected to a CPU and thus a sensible maximum of 496 I/O can be connected to the S7-200. The S7-200 can be used as a master or node on the PPI network, act as a master for the AS-i network, or with a S7-215 act as an intelligent gateway between the PROFIBUS-DP and AS-i network or PPI network, while controlling its own process I/O s.
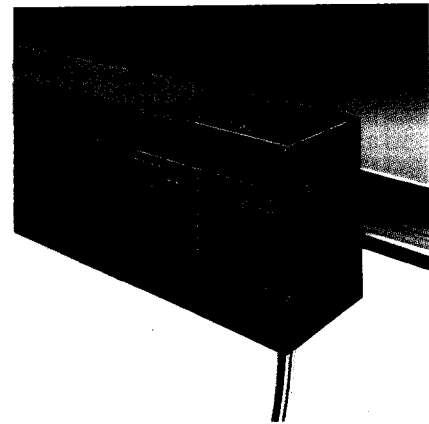
... and Speed

Why should only larger controllers retain the right to respond quickly and accurately in real time to process events? The S7-200 clears this hurdle with ease – in more ways than one. With its fast interrupt functions, counters with up to 20 kHz and pulse outputs which control or monitor the process simultaneously, the micro passes many a time and speed boundary which other controllers often don't even reach. In short: the real-time attributes of the S7-200 are outstanding in their class!
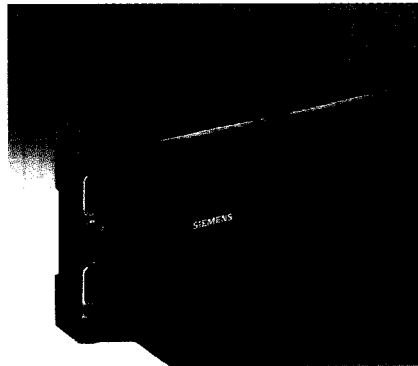
Event interrupt:
leaves no process event unnoticed

Do you need to react quickly to certain process events? Four interrupt inputs ensure that no process event goes unnoticed (e.g. an object falling through a light beam). Because with a maximum response time for the inputs of 0.2 ms and a processing time of only 0.8 µs for one binary instruction, the CPU is able to respond quickly to digital process signals and to control the process accurately.

Checking periodically with time-of-day interrupt

Do you want to periodically execute checking and monitoring functions or output signals to a process at specific intervals? Both totally independent of the overall program cycle? With the integrated time-interrupt functions of the S7-200, this is a very easy and flexible task. For example, the program cycle can be interrupted every 5 ms (resolution 1 ms!), and analog values that are required for checking pressures or torques can be read in and also corrected.
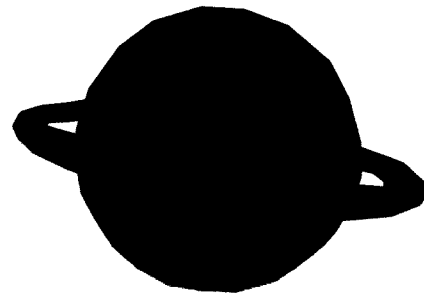
Position detection without problems – thanks to the counters

Do you have to count a great many events within a specified time? With counters featuring a counting frequency of up to 20 kHz (corresponds to as much as 80 kHz with four-edge evaluation), position detection can easily be implemented with incremental encoders. It goes without saying that other events, such as registering objects on a production line, can also be counted.

High-frequency pulse outputs for positioning

As the ideal supplement to the fast counters, two independent 4-kHz pulse outputs are provided, e.g. for positioning tasks with stepper motors via power sections. In conjunction with the numerous counter functions, it is possible to synchronize additional drives almost in real time.

Everything that Makes the Micro Complete

With the micro, we've thought of everything you might need for your automation task. As well as many features that the S7-200 provides by default, it also always offers the appropriate solution if you need a more unusual function. This includes CPU variants as well as the enormous instruction set, floating-point arithmetic, real-time clock, expansion modules, analog potentiometer, and so on ...
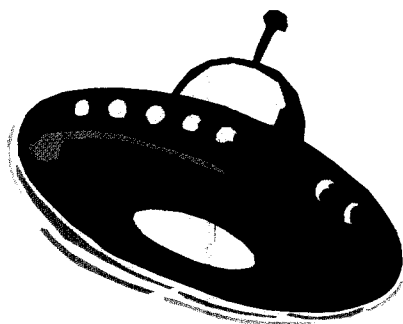
Instruction set – just right

The S7-200 offers the optimum instruction set for every task. Whether for implementing pure control tasks – with the easy-to-handle AND, OR and time functions - or for more demanding requirements, e.g. for processing analog or counter values with the integral fixed-point or floating-point arithmetic, the programming effort required is always minimal.

The PID controller – top class

Do you want to solve control tasks with the S7-200? The integrated PID controller makes it easy for you. And if you have to intervene very quickly in a process, instructions for direct I/O access enable the shortest response times.

Real-time-clock function – because time is always of the essence!

The S7-200 has an integrated real-time clock, which is set via software instructions. It measures hours, minutes, seconds, date and weekday. The integrated calendar function even takes account of leap years. You can count operating hours, heat up baths before work begins and give message logs a timestamp.
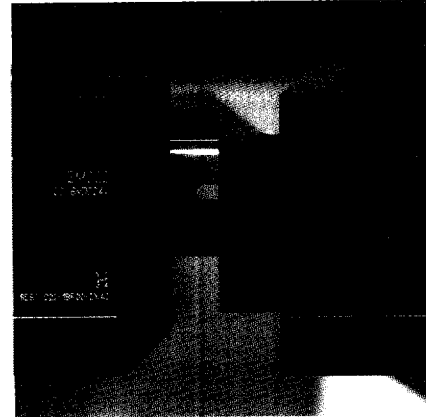
The specialists: expansion modules for all purposes

The aim of a compact controller is to have as many of the required I/O channels as possible integrated in the basic unit. But as soon as special combinations of I/O channels are required or analog-value processing also becomes necessary or the I/O requirement increases sharply, suitable expansion modules are needed. And here it is important that, on the one hand, the growing I/O requirement can be easily accommodated and, on the other hand, more I/Os can be implemented without wasting space. The S7-200 has made excellent provision for all these eventualities. There are expansion modules with 4, 8, 16 and 32 I/O. And if you have to switch large loads quickly: no problem – expansion modules with transistor outputs and currents up to 2.5 A are available – and they require no external amplifiers. When it's a matter of measuring voltages and currents precisely and quickly or recording temperatures with thermocouples and RTD s – you can do this in no time with the analog modules of the S7-200 with a resolution of 12 bits at a conversion rate of 25 µs.

The right setting – with the analog potentiometer

Are you looking for a way of optimizing the process flow "by hand adjustment"? With the integrated analog potentiometers of the S7-200, you can simply take your screwdriver and set memory values, time values, preset counter values or other parameters very finely without accessing the program. This is useful for changing, say, a welding time or an overshoot time quickly and directly.

Small and practical: the pluggable memory submodules

A small EEPROM memory submodule – only 11 x 29 x 17 mm in size – saves you heaps of time and money. It enables you to simply update, replace or copy your user program or recipes on the spot. And if necessary, the small component can be sent inexpensively and easily to your customers – much cheaper than if your technician had to be sent to and fro! Just plug it in, power cycle the CPU and the program is updated in a flash.

SITOP power: the controlled load-current power supply ideally suited to the SIMATIC S7-200

SITOP® power 24 V/3.5 A is the optimal power supply unit if the CPU of the SIMATIC S7-200 is no longer sufficient for connected loads, because the primary switched-mode regulator is fully geared to the micro PLC in its design and functionality. It can be integrated into the PLC system like an S7-200 module. The compact power supply module can be installed on the common DIN rail. Power-hungry output modules and connected loads are reliably supplied with 24 V. Even the most sensitive electronic loads, such as analog sensors, can be run with the precisely controlled 24 V direct voltage. The switchable input 120 V/230 V AC and the high degree of radio interference suppression, class B, allows the unit to be used in almost all environments – whether industrial or household.

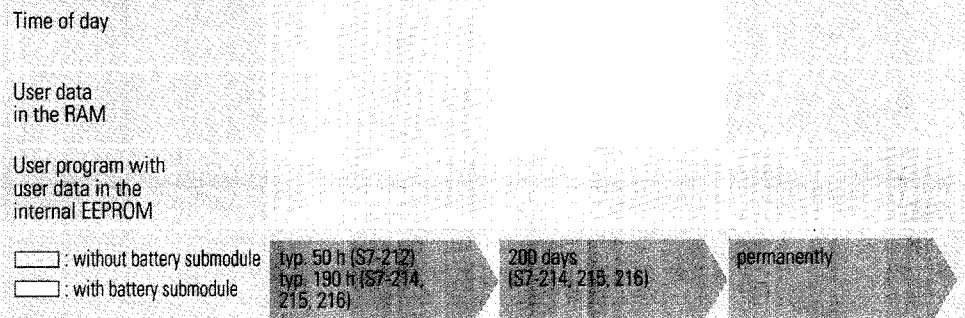## CPU variants: voltage and performance in three different ways

The micro is available as six options providing the ideal unit for each application.

The S7-200 Device Variants:

Supply voltage	Input	Output	S7-210	S7-212	S7-214	S7-215	S7-216
24 V DC	24 V DC	Transistor	●/1)	●/1)	●/1)	●/1)	●/1)
85-264 V AC	24 V DC	Relais	●/2)	●/3)	●/3)	●/2)	●/2)
85-264 V AC	120 V AC	Triac		●	●		
85-264 V AC	240 V AC	Relay	●				

●available, 1) sink input, 2) source and sink input in one device
3) Variants with source or sink input

The S7-200 Memory Concept

Time of day

User data in the RAM

User program with user data in the internal EEPROM

☐ : without battery submodule   typ. 50 h (S7-212)   200 days   permanently
☐ : with battery submodule   typ. 190 h (S7-214, 215, 216)   (S7-214, 215, 216)

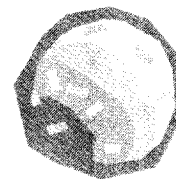## Absolutely safe, even with power failure

The S7-200 memory concept guarantees the safety of your data:
● Backup power is provided for the time of day and the user data via a super capacitor (maintenance-free) or a battery submodule in the event of a power failure.
● The user program and user data are saved permanently in the internal EEPROM.

Technical Specifications

Micro PLC	CPU 210	CPU 212	CPU 214	CPU 215	CPU 216
Functions					
Floating-point arithmetic	---	--	yes	yes	yes
PID control function	--	--	--	yes	yes
Program memory (EEPROM), approx. capacity	0.2 Kbyte 200 instructions	1 Kbyte, 500 instructions	4 Kbyte, 2 K instructions	8 Kbyte, 4 K instructions	8 Kbyte, 4 K instructions
Data memory	--	512 words	2 K words	2.5 K words	2.5 K words
Memory submodule	1 x necessary [2]	--	optional (EEPROM)	optional (EEPROM)	optional (EEPROM)
Memory backup (data), typ.	--	50 h	190 h	190 h	190 h
Battery submodule, typ.	--	--	200 days (optional)	200 days (optional)	200 days (optional)
Programming software	STEP 7 Micro/WIN, STEP 7 Micro/DOS				
Processing time per binary instruction	98 μs	1.3 μs	0.8 μs	0.8 μs	0.8 μs
Bit memories, counters, timers	128/2/2	128/64/64	256/128/128	256/256/256	256/256/256
High-speed counters	1 x 3 kHz 32-bit inc. sign bit	1 x 2 kHz; 32-bit inc. sign bit	1 x 2 kHz, 2 x 7 kHz; 32-bit inc. sign bit	1 x 2 kHz, 2 x 20 kHz; 32-bit inc. sign bit	1 x 2 kHz, 2 x 20 kHz; 32-bit inc. sign bit
Up/down counters	yes, simult. op. poss.	yes	yes, simult. op. poss.	yes, simult. op. poss.	yes, simult. op. poss.
Time-controlled interrupts	--	1 (5 to 255 ms)	2 (5 to 255 ms)	2 (5 to 255 ms)	2 (5 to 255 ms)
Hardware interrupts[1]	1	1	4	4	4
Inputs/outputs, integrated	4 DI/4 DO	8 DI/6 DO	14 DI/10 DO	14 DI/10 DO	24 DI/16 DO
Inputs/outputs, max. (via expansion submodules)	4 DI/4 DO --	78 DI/DO; 6 AI/2 AO	120 DI/DO; 12 AI/4 AO	120 DI/DO; 12 AI/4 AO	128 DI/DO; 12 AI/4 AO
Pulse outputs	--	--	2 x 4 kHz interrupt capability, pulse and frequency modulation		
Communications interfaces	--	1 x RS 485	1 x RS 485	2 x RS 485	2 x RS 485
Supported protocols, interface 0:	--	PPI (9.6 Kbit/s) or Freeport (19.2 Kbit/s)	PPI (9.6 Kbit/s) or Freeport (38.4 Kbit/s)	PPI (9.6 Kbit/s) or Freeport (38.4 Kbit/s)	PPI (9.6 Kbit/s) or Freeport (38,4 Kbit/s)
interface 1:	--	--	--	PROFIBUS-DP (9.6 Kbit/s to 12 Mbit/s)	PPI (9.6 Kbit/s) or Freeport (38.4 Kbit/s)
Analog potentiometer	1	1	2	2	2
Real-time clock	--	--	yes	yes	yes
Supply voltage (perm. range) with PLC version:					
DC/DC/DC	20.4 to 28.8 V/ 24 V/24 V	20.4 to 28.8 V/24 V/24 V		20.4 to 28.8 V/24 V/24 V	
AC/DC/relay	85 to 264 V/24 V DC: 5 to 30 V [3] AC: to 250 V	85 to 264 V/24 V/ DC: 5 to 30 V, AC: to 250 V		85 to 264 V/24 V [3]/ DC: 5 to 30 V, AC: to 250 V	
AC/AC/AC	--	85 to 264 V/79 to 135 V/20 to 264 V		--	
AC/AC/relay (supply voltage/inputs/outputs)	85 to 264 V/240 V DC: 5 to 30 V AC: to 250 V	--		--	
Degree of protection	IP 20 acc. to IEC 529	IP 20 acc. to IEC 529	IP 20 acc. to IEC 529	IP 20 acc. to IEC 529	IP 20 acc. to IEC 529
Dimensions (W x H x D) in mm	90 x 80 x 62	160 x 80 x 62	197 x 80 x 62	218 x 80 x 62	218 x 80 x 62
Weight approx.	0.2 kg	0.39 kg	0.49 kg	0.58 kg	0.58 kg

[1] Programmable interrupt response for positive and/or negative input edge
[2] For loading the user program, not necessary for operation
[3] Source input and sink input in one device

Progress
in Automation.
Siemens